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(54) Title: DIETETIC CHOCOLATE COMPOSITION (57) Abstract A dietetic chocolate composition sweetened by a bulk sweetener system and a process for making the dietetic composition. The chocolate compositions are sweetened by a bulk sweetening composition which includes 10-90 % by weight of maltitol, 9-89 % by weight of lactitol and 1-30 % by weight of polydextrose. This combination of sweeteners provides a dietetic chocolate product with a surprisingly high degree of sweetness, a significantly reduced glycemic index and reduced caloric content and a taste profile, texture and mouth feel which closely approximates conventional chocolate products. The process of the invention incorporates this bulk sweetening composition into a chocolate product.		

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Dietetic Chocolate Composition

FIELD OF THE INVENTION

The present invention relates to dietetic chocolate compositions sweetened by a bulk sweetening composition and to a process for making the chocolate compositions which closely approximate the taste profile, texture and mouth feel of traditional chocolate compositions.

BACKGROUND OF THE INVENTION

Dietetic chocolate products especially for diabetics, and dietetic chocolate compositions have been made using sorbitol. However, such compositions generally do not have a taste profile, texture and mouth feel which is comparable to that of traditional chocolate compositions.

Sugar free and no sugar added chocolate products have generally been manufactured using either a single alternative sweetener or a combination of two alternative sweeteners. Specifically, existing sugar free and no sugar added chocolate products typically employ as a single alternative sweetener either maltitol, lactitol, mannitol or xylitol, optionally in combination with an intense sweetener, as needed, to achieve the desired sweetness of the chocolate product. In addition, some proposed chocolate products may include other alternative sweeteners such as isomalt, sorbitol, erythritol or maltodextrin. Other existing sugar free and no sugar added chocolate products employ a sweetener system which consists of a combination of lactitol and polydextrose, also optionally including an intense sweetener, as needed, to achieve the desired sweetness. However, each of these systems fails to satisfactorily reproduce the taste profile, texture and mouth feel of conventional sugar-sweetened chocolate products.

Chocolate products sweetened solely with a maltitol sweetener exhibit a cooling effect that begins at the initiation of the eating experience and continues through and beyond the chewing cycle. This cooling effect is not typical of the taste profile of conventional sugar-sweetened chocolates which generally only exhibit a cooling effect at the onset of the eating experience because it is more intense and endures longer than in such conventional products wherein the

cooling effect usually becomes negligible during the chewing cycle. Moreover, chocolate products sweetened solely with maltitol do not provide a significant reduction in the glycemic index of the product relative to sucrose sweetened chocolate products nor do such products provide the same level of calorie
5 reduction provided by sweetening chocolate products with lactitol and/or polydextrose.

Chocolate products sweetened with lactitol or a combination of lactitol and polydextrose do not have a perceptible cooling effect at the onset of the eating experience. As a result, the consumer immediately notes a difference
10 between the taste profile of such products and the taste profile of conventional sucrose sweetened chocolate products which exhibit a mild cooling effect at the onset of the eating experience. Further, the delicious chocolate aftertaste which has become commonly associated with sucrose sweetened chocolate is inhibited in chocolate products sweetened with lactitol or a combination of lactitol and
15 polydextrose. Finally, the addition of a high intensity sweetener is required when using lactitol or a combination of lactitol and polydextrose in order to produce a chocolate product of sufficient sweetness.

One example of a dietetic chocolate product is given in Japanese patent application no. JP 10234302 published on September 8, 1998. This patent
20 application discloses a chocolate product wherein sucrose is replaced by a sweetener including a sugar alcohol selected from the group of lactitol, reduced isomaltose and maltitol, and a second sugar substitute selected from the group of polydextrose, xylitol, erythritol and maltitol. These sweeteners are employed for the manufacture of low fat chocolate products.

25 Another example of a dietetic chocolate product is disclosed in U.S. patent no. 5,490,996. In this product, a sweetener composition is employed which includes a combination of a sucrose substitute selected from polydextrose, inulin, mannitol, maltitol and mixtures thereof; and a sucrose substitute selected from lactitol, fructose, sorbitol, mannitol, xylitol, isomalt
30 and combinations thereof. A two-step manufacturing process is employed whereby the first sucrose substitute is processed separately from the second

sucrose substitute in order to permit use of different conching temperatures for each component of the sweetener.

European patent no. 599 830 B1 discloses reduced calorie chocolate compositions which employ as an alternative sweetener, a combination of a
5 sweetener selected from inulin, linear and branched fructo-oligosaccharides and mixtures thereof; a product selected from sucrose, fructose, sugar alcohols, isomaltose, polyglucose, polydextrose, polymaltose, carboxymethylcellulose, carboxyethylcellulose, arabinogalactan, microcrystalline cellulose or a mixture thereof; and a high intensity sweetener. This patent indicates that dietetic
10 chocolate compositions should preferably have a reduced caloric content, a reduced fat content, an increased fiber content, a beneficial effect on the intestinal metabolism, a reduced sugar content, and reduced cariogenic properties. Moreover, this patent recognizes the disadvantage that in the case of sugar substitutes such as lactitol in chocolate products, the high water content
15 of the chocolate mass may make it necessary to adapt the production process, often with significant processing delays. In the case of maltitol sweetened chocolate products, the maltitol is absorbed and metabolized in the human body thereby resulting in a smaller calorie reduction than is desirable.

It is accordingly a primary object of the present invention to provide a
20 dietetic, calorie reduced chocolate product which closely reproduces the taste profile, texture and mouth feel of conventional, sugar sweetened chocolate products. In particular, this object of the invention aims to provide a product which closely mimics the cooling effect of conventional sugar sweetened chocolate which is perceptible primarily during the initial eating experience, as
25 well as the pleasing chocolate aftertaste common to conventional sugar sweetened chocolate products.

It is a further object of the present invention to provide a dietetic chocolate product sweetened with an alternative sweetener composition which provides a surprisingly high degree of sweetness while at the same time
30 achieving a significant reduction in the caloric content and glycemic index of the chocolate product relative to conventional sugar sweetened chocolate.

It is a further object of the present invention to provide a dietetic chocolate product wherein sufficient sweetness can be achieved using an alternative sweetener composition in the absence of a high intensity sweetener.

These and other objects of the invention will be apparent from the
5 summary and detailed description of the invention which follows.

SUMMARY OF THE INVENTION

The present invention addresses the foregoing objects by providing a chocolate product that is sweetened by a combination of lactitol, maltitol and polydextrose. More specifically, in a first aspect, the present invention relates
10 to a dietetic, calorie reduced chocolate composition wherein sucrose sweetener or bulk sweeteners are partially or wholly replaced by a bulk sweetening composition which includes 10-90% by weight of maltitol, 9-89% by weight of lactitol, and 1-55% by weight of polydextrose. A more preferred composition (on a bulk sweetener basis) includes 30-70% maltitol, 20-60% lactitol and 10-
15 50% polydextrose. This specific combination of sweeteners, when used in a chocolate product, can provide a dietetic chocolate product with a surprisingly high degree of sweetness and a significant reduction in the caloric content and glycemic index, relative to conventional sugar sweetened chocolate products, and at the same time closely reproduces the taste profile, texture and mouth feel
20 of such conventional chocolate products.

The present invention also addresses the need for a dietetic chocolate product which can be made without employing a complicated manufacturing process. Thus, in a second aspect, the present invention relates to a process for the production of a dietetic chocolate product including the step of
25 incorporating in the chocolate product a bulk sweetening composition including 10-90% by weight of maltitol, 9-89% by weight of lactitol, and 1-55% by weight of polydextrose. Otherwise, conventional chocolate production processes can be employed to make the chocolate products of the present invention using conching temperatures of 40-80°C. The particular conching
30 temperature employed will depend on the ingredients of a particular composition.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The chocolate product of the present invention is a dietetic calorie reduced chocolate product which may be either sucrose free or may employ a reduced quantity of sugar relative to conventional chocolate products. In the present specification, "dietetic" refers to the reduction in the amount of, or
5 elimination of, sucrose from the chocolate product. The chocolate product of the present invention closely reproduces the taste profile, texture and mouth feel of conventional sucrose sweetened chocolate, particularly with respect to the cooling effect and chocolate aftertaste. Moreover, the bulk sweetening
10 composition of the invention provides a chocolate product wherein the use of an intense sweetener may not be required to produce the desired level of sweetness. These chocolate products can be prepared by substituting the bulk sweetening composition of the present invention for some or all of the sugars which are typically used to sweeten conventional chocolate products.

15 According to a first aspect of the present invention, a dietetic chocolate product is provided which comprises chocolate wherein the sucrose sweetener is partially or wholly replaced by a bulk sweetening composition which includes 10-90% by weight of maltitol, 9-89% by weight of lactitol, and 1-55% by weight of polydextrose. A more preferred composition includes 30-70% by
20 weight of maltitol, 20-60% by weight of lactitol and 10-50% by weight of polydextrose. Optionally, for particular applications, the bulk sweetening composition may further comprise up to 1% by weight of a high intensity sweetener. All percentages used herein are weight percentages, unless
25 100%.

The bulk sweetening composition of the present invention may be employed in a variety of chocolate products including sugar free chocolate, no sugar added chocolate and reduced sugar chocolate. The invention may be employed to produce milk chocolate, dark chocolate, white chocolate or
30 compound chocolate products. Moreover, the chocolate products of the present invention may be in the form of chips, bar products, enrobing coatings, as well

as chocolate coatings for ice cream products or for other applications where chocolate coatings are conventionally employed.

The cocoa material used in the chocolate products of the present invention may be selected from any of the chocolate liquors or cocoa powders
5 used in the preparation of chocolate confections and/or coatings. Chocolate liquor generally contains about 50% by weight of natural cocoa butter and/or cocoa butter substitutes having a reduced fat content, such as, for example, those disclosed in U.S. Patent Nos. 5,380,538 and 5,565,232, the disclosures of which are hereby incorporated by reference to the extent that these patents
10 disclose such reduced fat cocoa butter substitutes. Cocoa powders typically contain from about 5% to about 30% by weight of natural cocoa butter and cocoa butter substitutes having a reduced fat content.

Materials customarily used in formulating chocolate products can be included in the chocolate products of the present invention. For example, if no
15 sugar added milk chocolate is the desired end product, about 5-20% by weight of whole or non-fat milk solids can be included in the chocolate product of the invention. Other, optional ingredients for chocolate products may also be employed. Examples of such optional ingredients are natural food flavoring oils, oleoresins, oleoresin extract, artificial food flavorings, spices, coffee
20 flavor, nut meats, vanilla, malted cereal extract, salt, dietary fiber sources such as cocoa fiber, citrus fiber, wheat bran, corn bran, oat bran, pea bran and soy fiber, and lecithin and other emulsifiers, all of which are used at levels conventional for chocolate products. In the case of sugar free milk chocolate products, ingredients such as caseinates and whey-derived compounds may also
25 be employed.

The present invention involves the partial or complete replacement of sucrose in chocolate products with a bulk sweetening composition including lactitol, maltitol and polydextrose. The applicable ranges of the ingredients of the bulk sweetening composition are 10-90 % by weight of maltitol, 9-89% by
30 weight of lactitol and 1-55% by weight of polydextrose. More preferably, the bulk sweetening composition of the present invention includes 30-70% by

weight of maltitol, 20-60% by weight of lactitol and 10-50% by weight of polydextrose. The levels of the various ingredients will vary depending upon the application for which they are employed in order to accommodate, among other things, the sweetening and flavor release requirements of a wide range of chocolate liquors and chocolate and cocoa types. In this manner, the chocolate product can be formulated to optimize the various properties including, for example, caloric content, cariogenic properties, glycemic index, taste profile, texture and mouth feel.

The bulk sweetening composition of the present invention may comprise up to 65% by weight of the chocolate product. More preferably, the bulk sweetening composition comprises 20-55% by weight of the chocolate product.

The polydextrose component of the bulk sweetening composition may be employed in either the refined or unrefined form of anhydro-polyglucose. The polydextrose may also be partially or completely hydrogenated or in a fractionated form, if desirable. Preferred polydextroses for use in the present invention are sold by Cultor Ltd. under the names Litesse®, Litesse® II and Litesse® Ultra III. Fractionated polydextrose is a conventional, known material which may be made by the processes disclosed in U.S. patent nos. 5,424,418 and 4,948,596. Other polydextroses suitable for use in the present invention are disclosed in U.S. patent no. 5,645,647 and hydrogenated polydextroses as described in U.S. patent no. 5,601,863.

The maltitol component of the bulk sweetening composition may be employed in any solid form, preferably in a purified crystalline form and more preferably in a purified crystalline form wherein the maltitol exceeds 90% purity. The lactitol component of the bulk sweetening composition may be employed in the form of lactitol monohydrate, lactitol dihydrate, anhydrous lactitol or mixtures thereof.

The components of the bulk sweetening composition of the present invention may be utilized in the formulation of dietetic chocolate in their

crystalline form as well as other forms such as milled, spray dried, pulverized or granulated.

Optionally, a high intensity sweetener may be employed in addition to the bulk sweetening composition of the present invention. However, it has
5 been found that in some instances a high intensity sweetener will not be required to achieve an acceptable sweetness level for chocolate products in accordance with the present invention. If high intensity sweeteners are employed, they will typically be present in amounts of less than 1% by weight, more preferably less than 0.5% by weight and most preferably less than 0.2%
10 by weight, of the chocolate product. Suitable high intensity sweeteners include, but are not limited to, acesulfame K, L-aspartyl-L-phenylalanine methyl ester (aspartame®), alitame®, sucralose and mixtures thereof.

The chocolate products of the present invention may be refined using techniques which are conventional and known in the chocolate industry. The
15 chocolate products of the invention can be conched at temperatures ranging from about 40°C to about 80°C with no significant adverse effects on the chocolate product.

In the process of the present invention, the bulk sweetening composition described above is added to the chocolate during formulation as a partial or
20 complete replacement of the sucrose and other bulk sweeteners. In this manner, the chocolate product can be formulated using conventional processes to prepare an acceptable dietetic chocolate product.

The chocolate products of the present invention offer the advantages of a reduced caloric content and a lower glycemic index than conventional sucrose
25 sweetened chocolate products. Moreover, the products of the present invention closely reproduce the taste profile, texture and mouth feel of conventional sucrose sweetened chocolates.

More importantly, however, the bulk sweetening composition of the present invention has been found to exhibit a surprisingly high degree of
30 sweetness relative to the level of sweetness which would be expected from a simple mixture of the various sweeteners which make up the bulk sweetening

composition. As a result of this property of the bulk sweetening composition, lower levels of intense sweeteners may be utilized. Further, it may not be necessary to employ a high intensity sweetener in the chocolate product to achieve the desired level of sweetness. This avoids the bitter aftertaste or
5 lingering sweetness and potential consumer concerns which may be associated with such high intensity sweeteners and may also provide a cost reduction in the final chocolate product.

The invention will be further described with reference to the following illustrative examples of embodiments thereof.

10 Comparative Example A

In this comparative example, a formulation of a conventional dietetic milk chocolate using maltitol as the bulk sweetening agent was made using the ingredients shown in Table 1. The dietetic chocolate was tasted and the results are described in "flavor comments" in Table 1.

15 Comparative Example B

Another formulation of a conventional dietetic milk chocolate employing lactitol as the bulk sweetening agent was made using the ingredients shows in Table 1. The dietetic chocolate was tasted and the results are described as "flavor comments" in Table 1.

20 Example #1

Dietetic "milk" type chocolate was made with a blend of maltitol/lactitol and polydextrose. The formulation of this product is shown in Table 1. This sample exhibits a taste profile that closely approximated the taste, texture and mouthfeel of conventional (sugar) milk chocolate and
25 exhibited an acceptable level of sweetness. This observation was surprising since sucrose has a sweetness equivalent of 1.0 whereas the computed sweetness equivalent of the bulk sweetening composition employed in this example was about 0.4. This suggests that the combination of the three components in the bulk sweetening composition of the invention provided an
30 enhanced perception of sweetness in the chocolate product.

The computed sweetness equivalent of the bulk sweetening composition was based on the known sweetness equivalents of maltitol (about 0.9), lactitol (about 0.4) and polydextrose (about 0). These values for sweetness equivalents were then weighted based on the ratio of the amounts of the three ingredients in the bulk sweetening composition to compute the sweetness equivalent of about 0.4.

Example #2

Dietetic "dark" type chocolate was made using a blend of maltitol/lactitol and polydextrose that exhibits sweetening and flavor characteristics similar to example #1. The formulation of this product is shown in Table 1.

Example #3

"No Sugar Added" type milk chocolate was made using a blend of maltitol/lactitol and polydextrose that exhibits sweetening and flavor characteristics similar to example #1. The formulation of this product is shown in Table 1.

Example #4

A dietetic "milk" type compound chocolate made with a blend of maltitol/lactitol and polydextrose that exhibits sweetening and flavor characteristics similar to a sugar (sucrose) based "milk" type compound
5 chocolate coating.

Example #5

A dietetic "milk" type chocolate made using a blend of maltitol/lactitol and polydextrose that exhibits sweetening and flavor characteristics similar to example 1 that also delivers a 25%+ reduction in calories as compared with a
10 sugar (sucrose) based reference chocolate.

The foregoing examples were presented for the purpose of illustration and description only and are not to be construed as limiting the scope of the invention in any way. The scope of the invention is to be determined from the claims appended hereto.

TABLE 1

Comparative Example A		Comparative Example B		Example 1		Example 2		Example 3		Example 4		Example 5	
Ingredient	Maltitol	Lactitol	PDX	Lactitol Maltitol	PDX	Lactitol Maltitol	PDX (Dark)	Lactitol Maltitol	PDX (NSA)	Lactitol Maltitol	PDX (Compound)	Lactitol Maltitol	PDX (reduced cal.)
Kneader/Mixer													
Maltitol	48.56				24.28		20.00		20.53		21.50		3.15
Lactitol AC			48.56		24.28		20.00		20.54		12.50		28.30
Chocolate Liquor	16.00		16.00		16.00		42.00		16.00		0.75		16.00
Cocoa Powder											8.00		
Polydextrose	8.00		8.00		8.00		8.00		8.00		26.50		25.00
Cocoa Butter	10.00		10.00		10.00				10.48				10.00
Hydrogenated Palm Kernel Oil											15.75		
Casienate	1.50		1.50		1.50						2.00		1.50
Whole Milk Powder									14.00				
Calcium Carbonate	2.50		2.50		2.50						2.50		2.50
Anhydrous Milk Fat	4.00		4.00		4.00		4.00						4.00
Lecithin	0.10		0.10		0.10		0.10		0.10		0.10		0.10
Ace-K													0.04
Final Adjustment													
Cocoa Butter	9.00		9.00		9.00		5.55		10.00		10.00		9.00
Lecithin	0.27		0.27		0.27		0.28		0.28		0.30		0.30
Vanillin	0.07		0.07		0.07		0.07		0.07		0.07		0.06
Aspartame													0.02
Velivol											0.03		0.03
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Flavor Comments:													
Strong cooling Shallow flavor Chocolate taste ends abruptly Lacks fullness Sweet, cool aftertaste	Mild Chocolate flavor Minor cooling effect Minimal sweetness Dull chocolate aftertaste	Mild cooling Rich chocolate flavor Sweet Pleasing caramel, milk, chocolate, sweet aftertaste	Full/Strong chocolate flavor Mild cooling Rich chocolate, vanilla, sweet aftertaste	Mild cooling Rich milk and chocolate flavor Fullness in flavor Milk, caramel, chocolate, sweet aftertaste	Mild cooling mild chocolate flavor Sweet Pleasing milk, caramel, sweet chocolate after- taste	Mild cooling Rich chocolate flavor Sweet Pleasing caramel, milk, chocolate, sweet aftertaste							

What is claimed is:

1. A dietetic, calorie reduced chocolate composition wherein a sucrose or other bulk sweetening component is partially or wholly replaced by a bulk sweetening composition which comprises:
 - 5 10-90% by weight of maltitol,
9-89% by weight of lactitol, and
1-55% by weight of polydextrose.
2. A dietetic, calorie reduced chocolate composition as claimed in claim 1 wherein the bulk sweetening composition replaces substantially all of the
10 sucrose in the chocolate composition to provide a substantially sucrose-free chocolate composition.
3. A dietetic, calorie reduced chocolate composition as claimed in claim 1 wherein the bulk sweetening composition partially replaces the sucrose which is conventionally added to a chocolate composition to thereby provide a dietetic,
15 calorie reduced chocolate composition.
4. A dietetic, calorie reduced chocolate composition as claimed in claim 1 wherein the bulk sweetening composition further comprises a sufficient amount of a high-intensity sweetener to enhance the sweetness of the chocolate composition.
- 20 5. A dietetic, calorie reduced chocolate composition as claimed in claim 4 wherein the high-intensity sweetener comprises up to about 1% by weight of the chocolate composition.
6. A dietetic, calorie reduced chocolate composition as claimed in claim 1 wherein the bulk sweetening composition comprises:
 - 25 30-70% by weight of maltitol,
20-60% by weight of lactitol, and
10-50% by weight of polydextrose.
7. A dietetic, calorie reduced chocolate composition as claimed in claim 1 wherein the lactitol is present in a form selected from the group consisting of
30 anhydrous lactitol, lactitol monohydrate, lactitol dihydrate and mixtures thereof.

8. A dietetic, calorie reduced chocolate composition as claimed in claim 7 wherein the polydextrose is selected from the group consisting of purified polydextrose, unpurified polydextrose, hydrogenated polydextrose, a fractionated form of any of the foregoing forms of polydextrose and mixtures thereof.
9. A dietetic, calorie reduced chocolate composition as claimed in claim 1 wherein the chocolate composition is selected from the group consisting of milk chocolate, dark chocolate, white chocolate and compound chocolate.
10. A dietetic, calorie reduced chocolate composition as claimed in claim 1 wherein the bulk sweetening composition comprises up to 65% by weight of the chocolate composition.
11. A process for producing a dietetic chocolate composition which comprises the step of adding a bulk sweetening composition comprising:
- 10-90% by weight of maltitol,
 - 9-89% by weight of lactitol, and
 - 1-55% by weight of polydextrose,
- to the chocolate composition as a partial or complete replacement of sucrose and/or other bulk sweeteners.
12. A process as claimed in claim 11 wherein the bulk sweetening composition comprises:
- 30-70% by weight of maltitol,
 - 20-60% by weight of lactitol, and
 - 10-50% by weight of polydextrose
13. A process as claimed in claim 11 wherein the bulk sweetening composition further comprises a sufficient amount of a high-intensity sweetener to enhance the sweetness of the sweetening composition.
14. A process as claimed in claim 13 wherein the high intensity sweetener comprises up to about 1% by weight of the total sweetening composition.
15. A process as claimed in claim 11 further comprising the step of conching a mixture of the bulk sweetening composition and other ingredients forming the chocolate composition at a temperature of 40-80°C.

16. A process as claimed in claim 11 wherein the bulk sweetening composition replaces substantially all of the sucrose in the chocolate composition.
17. A process as claimed in claim 11 wherein the bulk sweetening composition partially replaces the sucrose in the chocolate composition.
- 5 18. A process as claimed in claim 11 wherein the chocolate composition is selected from the group consisting of milk chocolate, dark chocolate, white chocolate and compound chocolate.
19. A process as claimed in claim 11 wherein the bulk sweetening composition comprises up to 65% by weight of the chocolate composition.
- 10 20. A process as claimed in claim 11 wherein the polydextrose is selected from the group consisting of purified polydextrose, unpurified polydextrose, hydrogenated polydextrose, a fractionated form of any of the foregoing forms of polydextrose and mixtures thereof.
21. A process as claimed in claim 11 wherein the lactitol is present in a form
- 15 selected from the group consisting of anhydrous lactitol, lactitol monohydrate, lactitol dihydrate and mixtures thereof.